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PATENT SPECIFICATION

NO DRAWINGS



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COMPLETE SPECIFICATION

Improvements in or relating to the Manufacture of Mouldings

I, WILFRITH GEORGE ALLEN, a British Subject of "Cotteswell", Newbold Road, Wellesbourne, Warwickshire, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention has reference to the manufacture of mouldings of a light and rigid nature which are capable of a wide industrial application.

The object of the invention is to provide such mouldings and also a simple method for their manufacture whereby economic production can be obtained.

According to this invention the method of moulding manufacture is characterised by treating a body of foam-like form such as polyurethane foam with a hard setting resin, forming the treated body to the required shape in a mould, and allowing curing of the resin to take place whilst the body is in the mould.

The method of manufacture is further characterised by the application of a facing coat to the moulding surface or surfaces of the mould prior to the latter receiving the treated body whereby a smooth surface is imparted to the moulding produced.

In carrying the invention into practice a suitable body of the foam-like material such as polyurethane foam is treated with a hard setting resin such as by soaking or immersing the body in the resin so that the body becomes fully impregnated with the resin. A suitable resin for the purpose is a polyester, epoxy or resorcinol-formaldehyde resin which may contain an appropriate catalyst and accelerator or hardener.

After such impregnation, resin in excess of that necessary for actual requirements is expressed from the body by subjecting it to pressure such as between rollers. The degree

of impregnation finally obtained in this way should be such that the interstices of the foam-like material of the body are wetted or coated with the resin throughout the body.

The impregnated body free of such surplus resin is then placed in or on a mould of the required form, the moulding surface or surfaces of the mould having been treated with a parting agent such as a suitable wax and, where a smooth non-cellular finish is required to the moulding, a facing coat is also applied to the said mould surface or surfaces after treatment of the latter with the parting agent. Such facing coat may consist of the same resin used for impregnating the foam together with a hardener and mineral filler (e.g. French chalk) with or without a thixotropic agent and/or a pigment. The facing coat may be applied in any convenient manner to the mould surface or surfaces such as by means of a brush, spray gun, spatula or other suitable applicator and the thickness of the facing coat is determined by the density of the polyurethane foam and the depth of non-porous skin required to the finished moulding.

The flexible and pliable nature of the impregnated polyurethane foam facilitates application to the mould surface or surfaces and after initial location on or against the latter can be patted or pressed more intimately against the mould surface or surfaces and into any facing coat thereon.

The body is left in or on the mould until the resin has cured and on removal the body will be found to be very light owing to its foam-like or porous texture and extremely rigid due to the fact that its cell walls are coated with the cured resin. Where a facing coat has been employed a high finish is imparted to the surface or surfaces of the moulding.

A mould for use in the above method may

be inexpensively produced either from the same material as the moulding, i.e. impregnated polyurethane foam cured and preferably facing coat finished as aforesaid, or from a cured mixture of an epoxy resin, a hardener, a filler (such as French chalk, calcium carbonate, titanium oxide or any inert metallic or non-metallic filler) and chopped strand glass fibres. Such a mould can easily be formed from a pattern of any suitable and compatible rigid material such as wood, plaster or metal.

In the formation of panels (e.g. for vehicle bodies) suitable sheets of polyurethane foam may be treated and moulded in the same manner already described. Where necessary two or more pieces or sheets of the impregnated foam may be placed in or on a mould with adjacent contacting edges which due to their treatment with the resin (or additional treatment therewith) causes the sheets or pieces to become joined in an integral manner with adequate strength at the joint or joints.

In a development of the method of manufacture offering advantages as regards economy and convenience in production the mouldings are built up from pieces of the foam which may be of a standardised nature e.g. in strip form of suitable width and length.

The dry polyurethane foam may be cut into strips e.g. two or three inches wide and six feet or thereabouts long for convenient handling by an operator. For impregnation purposes the strip or strips may be loosely coiled and the coil so formed placed so as to lie in a container which may be of cylindrical form. Sufficient resin is introduced into the container so as to immerse the coil or coils and a pressure member such as a plate at one end of a handle is then introduced into the container whereby it may be pressed against the coiled foam to compress the latter and thus expel air therefrom. On release of such pressure re-assertion of the foam causes resin to be drawn into the interstices thereof. The alternate application and release of pressure or "pumping" of the pressure member in this way is continued until the foam becomes fully impregnated whereupon pressure is finally applied to express excess resin which is drawn off into another container e.g. for subsequent use. If necessary the strip can be passed between rollers to further expel such excess resin.

In forming a moulding the pliable impregnated foam strips are placed in or on the mould in edge to edge contact in order to form or build up a panel or moulding of any desired shape.

A moulding may be built up from one or more layers of strips or pieces in this way and in the case of a panel or similar form of moulding the strips of one layer may run transversely to that of another layer or other

layers. Thus a laminated construction of considerable strength may be provided.

During moulding excess foam strip can be cut away and the cut off pieces utilised as necessary elsewhere in or on the mould to fill any open spaces. In this way wastage of the foam material is reduced to a minimum whilst it will also be appreciated that, dependent on the size of the moulding to be produced, only a comparatively small quantity of resin is necessary for effecting impregnation of the strips or pieces as against the quantity required for immersing large sheets of foam. Furthermore handling of such sheets immediately after impregnation is liable to be inconvenient owing to the slippery nature of the freshly impregnated foam.

In accordance with a further feature of the invention inserts or additions of other material may be included in the moulding during forming of the latter and for example metal inserts or re-inforcements may be included. Thus in the case of a moulding such as a door or panel that is to be hingedly mounted, one or more hinge plates may be inserted into the impregnated foam on the latter being placed in or on a mould. The inserted member should be chemically cleaned and brushed with the resin prior to being inserted in position. Ribs or reinforcements of the same polyurethane or foam material as the moulding can also be mounted in or on the latter in a similar manner i.e. by means of the resin.

Where, as already referred to, a polyester or epoxy resin is employed, curing at room temperature is usually accomplished in about twelve hours, or only in three hours if resorcinol-formaldehyde resin is used. However such curing times can be substantially reduced if heating in an oven or by infra-red lamps is employed.

As an alternative to cold setting resins, which usually have a restricted pot life, a resin formulation capable of rapid polymerisation at temperatures of the order of 80° to 100° C. but having a pot life at room temperature of several days may be used.

Any trimming of the moulding that is required after removal from the mould on curing, may be carried out by a file, glass paper or the like. Any open or porous faces may be sealed by brushing on a facing coat mixture and allowing it to cure. If desired a face or faces of the moulding may be lined with sheet material such as metal, wood, synthetic plastic material (e.g. polyvinyl chloride (PVC) or polystyrene) or woven or non-woven textile materials. Alternatively the moulding may be subsequently faced with such material.

Impact strength of the moulding can be increased as desired by the inclusion of polysulphide polymers in the resin e.g. in instances where the moulded products are mudguards.

Damage to the mouldings may be easily repaired. Thus cracks may be remedied by

opening the crack, inserting some resin, closing the crack and allowing to cure. Dents may be repaired by filling with resin (preferably of the same colour) and filing or abrading to contour after curing. Holes may be repaired by introducing suitably shaped pieces or plugs of the foam which are sealed in position by means of resin. Prior to such filling the hole may be trepanned and the edges chamfered to obtain satisfactory adhesion of the inserted piece.

In addition to the method herein described of producing light rigid mouldings the invention also includes within its scope mouldings when produced by such method and it is found that such mouldings have naturally good sound absorbing or "anti-drumming" properties whilst they are also very good thermal insulators. Furthermore the mouldings can be such as to withstand compressive loads e.g. of the order of 165 to 215 lbs. per square inch without taking a permanent set.

WHAT I CLAIM IS:—

1. Method of moulding manufacture characterised by treating a body of foam-like form such as polyurethane foam with a hard setting resin, forming the treated body to the required shape in a mould, and allowing curing of the resin to take place whilst the body is in the mould.

2. Method of moulding manufacture according to Claim 1 wherein a facing coat is applied to the moulding surface or surfaces of the mould prior to the latter receiving the treated body whereby a smooth surface is imparted to the moulding produced.

3. Method of moulding manufacture according to Claim 1 or 2 wherein prior to placing the body of foam-like form in the mould, the body is treated with the resin by soaking or immersing the body in the latter so that the body becomes impregnated with said resin and subsequently expressing resin from the body in excess of that necessary to wet or coat the interstices of the foam-like material substantially throughout said body.

4. Method of moulding manufacture according to any of the preceding claims wherein the hard setting resin consists of a polyester epoxy or resorcinol-formaldehyde resin which may contain an appropriate catalyst and accelerator or hardener.

5. Method of moulding manufacture according to any of the preceding claims wherein the moulding surface or surfaces of the mould are pretreated with a parting agent such as a suitable wax.

6. Method of moulding manufacture according to Claim 2 wherein the facing coat con-

sists of any of the resins that may be used for impregnating the body of foam-like material, together with a hardener and mineral filler and with or without a thixotropic agent and/or a pigment.

7. Method of moulding manufacture according to any of the preceding claims wherein the moulding is formed from separate pieces of the treated foam-like material which are joined together in or on the mould by the impregnating resin and/or additional resin.

8. Method of moulding manufacture according to Claim 7 wherein the pieces of foam-like material are of standardised shape such as of strip form.

9. Method of moulding manufacture according to Claim 7 or 8 wherein a moulding such as a panel is formed from one or more layers or laminations of pieces or strips of the treated foam-like material.

10. Method of moulding manufacture according to Claim 9 wherein the pieces or strips of one layer or lamination of the moulding are arranged transversely or crosswise relative to those of an adjacent layer or lamination.

11. Method of moulding manufacture according to Claim 8, 9 or 10 wherein strips of the foam-like material are treated with the resin by coiling the strips and immersing them in the resin in a suitable container.

12. Method of moulding manufacture according to Claim 11 wherein the coiled strip material is subject to alternate application and release of pressure by a pressure member whilst immersed in the resin in order to effect thorough impregnation by the latter.

13. Method of moulding manufacture according to any of the preceding claims wherein inserts such as hinge plates or reinforcement members or ribs are embodied in or on the moulding during production of the latter in or on a mould.

14. Method of moulding manufacture according to any of the preceding claims wherein the moulding is faced during production of the latter in or on a mould, or subsequently, with sheet material such as metal, wood, synthetic plastic material or woven or non-woven textile materials.

15. Method of moulding manufacture according to any of the preceding claims wherein the hard setting resin includes polysulphide polymers with a view to increasing the impact strength of the moulding.

16. Method of moulding manufacture substantially as herein described.

17. Method of moulding manufacture according to any of the preceding claims wherein the mould itself is produced by substantially the same method of manufacture.

18. Mouldings when produced by the method of manufacture according to any of the preceding claims.

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